

REMARKS/ARGUMENTS

This is an RCE of U.S. Application No. 10/528,005, filed on June 9, 2006. An IDS accompanies this RCE. Claims 1-6 and 25-40 were pending before this amendment. Claims 33-40 had been withdrawn from consideration in a previous amendment. Applicant respectfully requests reconsideration and withdrawal of the rejections in view of the following remarks.

I.) Claim Rejections – 35 USC § 103

A.) Claims 1,3, 5-6, 25-29 and 31-32

Claims 1-3, 5-6, 25-29 and 31-32 were rejected under 35 U.S.C. 103(a) as being unpatentable over Messier (U.S. 6,224,655) in view of Pike et al (U.S. 5,873,968). The Office Action from March 30, 2009 alleges that Messier teaches the claimed protective media (e.g., filter) but does not teach that the filter is a dielectric carrier and has an electrostatic charge. However, the Office Action contends that Pike teaches a filter medium having an electret microfiber web. Hence, the Office Action alleges that “Pike presents a finding that one of ordinary skill in the art could have substituted the electrostatically charged filter in the biostatic filter and the results of the combination would have been predictable.” Applicant respectfully disagrees.

In the latest Office Action, the Examiner has requested evidence that demonstrates that the results of the presently claimed combination are unexpected. In response, the inventor named on the present application has prepared a 132 Affidavit which is submitted along with this RCE. In the Affidavit, the inventor provides data that demonstrates the synergy between combining an electret and an antimicrobial iodinated resin in a filter media. Furthermore, as discussed in detail below, results obtained by the inventor are completely unexpected.

Although there was recognition that imparting an electrical charge to a protective filter media increases the filtration efficiency and enhances particle capture, the charge deteriorates if the filter is subjected to various contaminants, particularly oily contaminants. As a result, filtering efficiency of an electret nonwoven filter decreases over time. Various methods have been used to stabilize the charge on a nonwoven electret filter media. The majority of these methods utilize a fluorochemical additive such as a fluorochemical oxazolidinone, a

fluorochemical piperazine or a perfluorinated alkane. *See* U.S. Patent No. 7,244,292 at columns 1-2. Other methods involve using a hindered amine, nitrogen-containing hindered phenol, and metal-containing hindered phenol stabilizer as an additive to stabilize the charge. *See* U.S. Patent No. 5,057,710.

The prior art does not teach or suggest using antimicrobial active agents, as in the present invention, that are capable of stabilizing the charge of a nonwoven electret filter media. In fact, as discussed below, the prior art teaches against incorporating antimicrobial agents into a nonwoven filter media. Hence, as of the filing date of the present invention, there was a strong need to develop antimicrobial filter media that have high filtration efficiency.

Applicant has surprisingly found that adding an iodinated resin stabilizes the electrical charge applied to a nonwoven electret filter media while at the same time providing a high level of antimicrobial efficacy to the resultant media. The 132 Affidavit submitted by the inventor compares samples containing iodinated resin (Triosynated samples) with control samples (non-Triosynated samples) where iodinated resin has not been added. As discussed in the Affidavit, the iodinated resin actually stabilizes the charge on the electret. For instance, in Table 1, the Applicant shows that static charge on the electret is significantly higher on the filter containing iodinated resin than on the filter without the resin. The results are consistent for electret filter media either exposed or not exposed to a viral load. Tables 2-4 show the results of a standard DOP test used to measure filtration efficiency. Measurements were taken prior to and after exposure to a viral load. The results shown in Tables 2-4 reveal that the filtration efficiency of the electret media is increased in the presence of the iodinated resin. Hence, the iodinated resin preserves the electrostatic charge of the filter media.

Unlike the present invention, prior attempts to generate an antimicrobial electret filter media by introducing an antimicrobial agent into the nonwoven have met with limited success. U.S. Patent No. 5,556,618 (the ‘618 patent) reviews various attempts at generating an antimicrobial electret material. However, the ‘618 patent points out that the antimicrobial material generally deteriorates the electret performance of the protective filter media and hence, has a detrimental impact on filter performance. This was particularly true when organic antimicrobial agents are used, which are conducted by the electret filter media protective media. The ‘618 patent attempts to mitigate the problem by using a combination of charge stabilizers along with an inorganic antimicrobial agent. However, processing is rather complicated owing to

the significant number of materials in the filter. Moreover, the amount of antimicrobial agent must be kept to a small percentage in order to retain the charge in the media. In the protective filter media of the present invention, the concentration of the antimicrobial iodinated resin need not be diluted in order to maintain the electrostatic capacity of the filter media.

U.S. Patent No. 6,514,306 ("the '306 patent") further teaches that "high loading of antimicrobial agent may interfere with certain electret fiber filter elements." See the '306 patent at col. 1, ll. 65-67. This is particularly true when the antimicrobial agent is embedded in the resin melt and subsequently spun into fibers. *Id.* at Col. 1, ll. 56-67. In the present invention, iodinated resin enhances the electrical properties of the nonwoven electret filter media, even in the embodiments where the iodinated resin is embedded into the polymer melt and spun into fibers.

The prior art does not teach or suggest using an antimicrobial agent as a charge stabilizer in a nonwoven material. In fact, with the exception of a few inert materials discussed above (e.g. fluorochemical additives) that have been found to stabilize charge, the art has generally taught keeping the nonwoven electret free of any additives. As an example, U.S. Patent No. 4,086,499 ("the '499 patent") states that both electron-donor additives and electron-acceptor additives result in significant charge decay of the nonwoven electret. For instance, the '499 patent states:

As a result of our work, we consider such *impurities* as residual monomers, alpha-methyl styrene, aromatic solvents, anthracene, and *especially* polarizable groups such as *iodine*, bromine, etc., as well as tetracyanoethylene, tributyl phosphate, and the like, to be *deleterious* to the stability of the electrets made from styrene-type polymer (emphasis added).

See the '499 patent at Col. 1, ll. 67.

The deleterious effects of such additives, including iodine, on the stability of electrets indicates why it has been difficult to develop an antimicrobial nonwoven electret filter media.

Based on the teachings of the prior art, results obtained with the inventive antimicrobial electrets are clearly unexpected. There is no teaching or suggestion in the art that an iodinated resin would increase the charge capacity of the filter media. In fact, the art as a whole teaches away from this finding. Both organic impurities and iodine are known to have a negative contribution on the electrical properties of the filter media. Accordingly, a person of ordinary

skill would expect that an iodinated resin would have a deleterious effect on the filtration efficiency of the media. The fact that the opposite occurs is surprising.

Moreover, it should be pointed out that given the negative effect of impurities, particularly iodide, on nonwoven electrets, there was a lack of motivation to make the currently claimed invention as of the filing date of the present application. The number of failures encountered in producing antimicrobial nonwoven electret filter media (*see*, for instance, the '618 patent) attests to the fact that there are considerable difficulties encountered in producing a filter with both antimicrobial properties and a high degree of filtration efficiency. Additionally, given the prior art failures encountered in the development of antimicrobial nonwoven filters, there would not be a reasonable expectation that one would succeed as the applicant in the presently claimed invention clearly has.

In the latest Office Action, the Examiner states that unexpected results must be demonstrated. The fact that the iodinated resin increases the charge capacity and stabilizes the electret reveals the synergy between the iodinated resin and the electret. In addition to the unexpectedly good electrical properties, the claimed filter is also highly efficacious, as demonstrated by examples in the originally filed specification.

Consequently, reconsideration and withdrawal of the rejections over 35. U.S.C. 103(a) are earnestly requested.

II.) Claims 4 and 30

Claims 4 and 30 were rejected under 35 U.S.C. 103(a) as being unpatentable over Messier (U.S. 6,224,655) in view of Pike et al (U.S. 5,873,968) in further view of Messier '452 (U.S. 5,639,452). The Examiner repeats the rejection with respect to claim 1 and further adds that Messier '452 teaches an iodinated resin where the iodine is impregnated in the resin. However, Applicant submits that Messier '452 does not correct the deficiencies present in Messier and Pike, which were discussed above.

Hence, for at least the same reasons discussed with respect to claims 1,3, 5-6, 25-29 and 31-32, reconsideration and withdrawal of the rejections over 35. U.S.C. 103(a) are earnestly requested.

CONCLUSION

Based on the foregoing amendments and remarks, favorable consideration and allowance of all of the claims now present in the application are respectfully requested.

Should the Examiner require or consider it advisable that the specification, claims and/or drawings be further amended or corrected in formal respects in order to place the case in condition for final allowance, then it is respectfully requested that such amendment or correction be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing this case to allowance, the Examiner is invited to telephone the undersigned.

The Commissioner is authorized to charge any required fees, including any extension and/or excess claim fees, any additional fees, or credit any overpayment, to Goodwin Procter LLP Deposit Account No. 06-0923.

Respectfully submitted for Applicant,

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